“Prolongation of T2 Stratification after Microfracture Does Not Indicate Normal Cartilage” - Response

Cartilage
2(4) 400–401
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DOI: 10.1177/1947603510397881
http://cart.sagepub.com

Dear Editor,

Recent research by Saris *et al.* has given us knowledge with a high level of evidence regarding the superiority of autologous chondrocyte implantation to microfracture in the knee.^{1,2} There are no comparable data available for the ankle at this time. Ankle biomechanics and ankle cartilage biology differ from the knee,³ and based on the good clinical results reported in the literature,^{4,5} we hypothesize that microfracture in the ankle may provide comparable repair tissue quality when compared to autologous chondrocyte implantation.

The aim of this study was to provide the community with the first results of T2-mapping after microfracture in the ankle in order to encourage the integration of the technique as additional effect size in clinical research. We definitely need larger numbers to evaluate if these preliminary results will hold.

We are excited to see that our incentive is shared by other investigators; however, there are some concerns regarding the authors' view on the methodological limitations of T2-mapping in the ankle.

T2-mapping is sensitive but not very specific to changes in articular cartilage. It is not valid to state that the repair tissue resembled normal cartilage based on T2-mapping. T2 does not give sufficiently specific data to say this; for example, the glycosaminoglycan content is not assessed.

The example given in Figure 1 of the letter to the editor for diffuse prolonged T2 in repair tissue may be compromised by the magic angle effect. It is difficult to differentiate between increased T2 because of increased water content or because of the orientation to the static magnetic field. This is why we prefer sagittal T2 maps. Also, a false color code scale should be given to provide an estimate of the range of T2. At 3T, we suggest using 0 to 100 milliseconds.

It should be noted that while there is ample evidence supporting that microfracture results in fibrous repair tissue in the knee, it might be different in the ankle. Also, T2-mapping is not specific of the collagen type assessed.

We do agree that a zonal (bilaminar) assessment to judge the collagen network organization as well as an analysis of the different areas within the repair tissue would be interesting, but one has to recognize the limitations of the technique.

The signal-to-noise ratio and in-plane resolution available at 3T did not suffice to carry out a bilaminar evaluation because it would have been highly subjected to partial volume artifacts, which led us to go for full-thickness regions of interest (ROIs). The same considerations account for the evaluation of central/peripheral/interface zones of the repair site.

We think that an average T2 value of the repair tissue as a whole will work better in clinics because it is far more robust to reading errors. Also, with regard to the individual variation in cartilage T2, we find that relative values are useful in cartilage repair assessment.^{6–8} With regard to the examples shown in Figure 3 of the manuscript, the repair tissue was included as a whole in the ROI, so the area in question was included.⁹

Our study represents a series of only 14 cases and therefore subjected to the obvious limitations in terms of the level of evidence. Again, we agree that no conclusions to clinical practice can be drawn at this time; however, in light of the limited data on cartilage repair tissue composition in the ankle after microfracture, we feel it is important to do extended research in this field.

Warm Regards,
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